



GE Astro Space

**THE EARTH OBSERVING SYSTEM (EOS)
NICKEL-HYDROGEN BATTERY**

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EOS OVERALL PROGRAM

THREE PHASE PROGRAM

**LIFE EVALUATION TEST PHASE
ACCEPTANCE TESTS
CHARACTERIZATION TESTS
FIVE YEAR LEO LIFE TEST**

**ENGINEERING PROTOTYPE (WORKHORSE) HARDWARE
FOUR COMPLETE BATTERIES
FULL QUALIFICATION**

**PRIME FLIGHT HARDWARE
FIVE COMPLETE BATTERIES**

LIFE EVALUATION TEST PHASE

HARDWARE FROM TWO VENDORS

12 CELLS FROM EACH

STRAIN GAGES ON ALL 12 CELLS

PRESSURE TRANSDUCERS ON 4 CELLS

ACCEPTANCE TESTS

PERFORMED AT VENDOR ON ALL CELLS

CHARACTERIZATION TESTS

NINE CELLS

**3 CELLS WITH PRESSURE TRANSDUCERS
TESTED AT GE ASD**

LIFE TEST

SEVEN CELLS

**3 CELLS WITH PRESSURE TRANSDUCERS
TESTED AT GE ASD**

ADDITIONAL TESTS

THREE CELLS

**1 WITH PRESSURE TRANSDUCER
TESTED AT NASA GSFC**

CELL DESCRIPTION

GENERAL

50 AMPERE HOUR NAMEPLATE

3.523 INCHES MAXIMUM OD

RABBIT EAR TERMINAL CONFIGURATION

DOUBLE LAYER ZIRCAR SEPARATOR

BURST FACTOR 3.0 MINIMUM

CELL DESCRIPTION (Cont)

VENDOR COMPARISON		VENDOR A	VENDOR B
CELL WEIGHT (LOT AVE.) GRAMS		1476	1515
CELL LENGTH (DOME TO DOME)		7.820	6.991
TERMINAL SEAL		ZIEGLER	CERAMIC
ELECTRODE CONFIGURATION		BACK-BACK	RECIRCULAT.
PLAQUE		SLURRY	SINTER
ELECTROLYTE - % KOH		31.0	31.0
PRECHARGE		NICKEL	HYDROGEN
WALL WICK		YES	YES
CATALYZED		YES	NO
PRESSURE VESSEL THICKNESS (INCHES)		0.023	0.024
BURST PRESSURE (PSIG)		2900	2700
PREDICTED MEOP (PSIG)		705	800
BURST FACTOR		4.1	3.38

ACCEPTANCE TESTS

THREE (MINIMUM) BURN IN CYCLES, C/2 @ 10C
SEVEN CAPACITY CHARGE/DISCHARGE CYCLES (WITH LETDOWN)

DISCHARGE RATE	TEMPERATURE (DEG C)		
	-5	0	10
C/2		1	1
C	1		3
			1

THREE OVERCHARGE TESTS (-5C, 10C, 25C)
CHARGE @ C/20 FOR 48 HOURS
DISCHARGE @ C/2

ONE PULSE DISCHARGE TEST (10C)
2C FOR 20 SECONDS
DISCHARGE @ C/2

ONE CHARGE RETENTION TEST (10C)
72 HOUR OC STAND
DISCHARGE @ C/2

CHARACTERIZATION TESTS

TWO (MINIMUM) CONDITIONING CYCLES, C/2 @10C
ELEVEN CAPACITY CHARGE/DISCHARGE CYCLES

DISCHARGE RATE	TEMPERATURE (DEG C)					
	-10	-5	0	5	10	20
C/2	1	1	1	2	1	1
C	1		1	1	1	

ONE OVERCHARGE TESTS (-10C)

CHARGE @ C/20 FOR 48 HOURS

DISCHARGE @ C/2

TWO CHARGE RETENTION TESTS (10C)

72 HOUR OC STAND

DISCHARGE @ C/2

TWELVE VOLTAGE/TEMPERATURE CHARACTERIZATION TESTS

THREE SEPARATE V/T LEVELS

FOUR TEST TEMPERATURES (-10C, 0C, 10C, 20C)

LIFE TEST

TESTED AS SEVEN CELL BATTERY PACKS
ONE PACK PER VENDOR
MOUNTING TO SIMULATE ACTUAL BATTERY ASSEMBLY
VERTICAL MOUNT
CONDUCTIVE THERMAL SLEEVES
COLD PLATE
THERMAL BLANKET

TEST TEMPERATURE: 5C +/- 2C

TEST DURATION: 5 YEARS (26,500 CYCLES)

CHARGE PARAMETERS

64 MINUTES

COMPOSITE REGIME (TBD AMPS TO V/T, CLAMP AT V TO TBD C/D,
TRICKLE TO END OF CHARGE)

DISCHARGE PARAMETERS

34.9 MINUTES

DISCHARGE AT C/2 (25 AMPS)

14.8 AMPERE HOURS (29.6% DOD, BASED ON NAMEPLATE)

BATTERY SYSTEM DESCRIPTION

GENERAL

FOUR BATTERIES PER SATELLITE
TWO BATTERY PACK ASSEMBLIES PER BATTERY
27 CELLS PER BATTERY PACK ASSEMBLY
216 CELLS TOTAL

BATTERY PACK ASSEMBLY

27 CELLS
TOTAL WEIGHT: 118 POUNDS MAXIMUM
ENVELOPE: 24" LONG X 20" WIDE X 9.25" HIGH
CELLS ARE VERTICAL MOUNTED
CONDUCTIVE THERMAL SLEEVES
LETDOWN/RECONDITIONING CIRCUITRY
REDUNDANT HEATERS ON EACH CELL
BYPASS DIODES
INDIVIDUAL CELL VOLTAGE MONITORING
PRESSURE MONITORING (2 CELLS)

